REMARKS

The enclosed is responsive to the Office Action mailed on March 31, 2008. At the time the Examiner mailed the Office Action claims 1-10 and 28-31 were pending, and claims 11-27 were cancelled. By way of the present response no claims have been amended and no new claims have been added. As such, claims 1-10 and 28-31 are now pending. Applicants respectfully request reconsideration of the present application and the allowance of all claims now presented.

Claim Rejections - 35 U.S.C. §112, first paragraph

The Examiner has rejected claims 1-10 and 28-31 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description and enablement requirements.

Applicants provided evidence in declaration form (37 CFR 1.132) in the response mailed February 20, 2008 in which inventor Stephen W. Montgomery attested *inter alia* the following:

> 6. Computer-aided molecular design was widely used in industry at the time of the invention as a method for modeling molecule structures and predicting structure-behavior relationships of molecules. Exhibit A attached herewith provides a list of references demonstrating the use of HyperChem in 2004. Exhibit A demonstrates that HyperChem was widely used in industry at the time of the invention as a method for modeling molecule structures and predicting structure-behavior relationships of molecules.
>
> 7. Functionalization of carbon nanotubes was widely studied at the time of the invention. Exhibit B attached herewith provides a list of references demonstrating the attachment of functional groups to carbon nanotubes. Exhibit B demonstrates that several methods of functionalizing carbon nanotubes were widely available at the time of the invention.
>
> 8. Based on these observations, it is my professional opinion that one of ordinary skill in the art at the time the

> invention was made, upon review of the Application, would be able to obtain commercially available nanotube segments, synthesize the connector molecule, and bond it to both the nanotube segments as well as to a plurality of other connector molecules to form a three-dimensional nanotube structure.
>
> 9. In addition, it is my professional opinion that the Application conveys with reasonable clarity to those skilled in the art, and particularly those familiar with computer-aided molecular design software such as HyperChem, that as of the filing date sought, the inventors, including myself, had possession of the invention as claimed in all presently pending claims.

In response, the Examiner states that the 37 CFR 1.132 declaration does not address how to make the invention as claimed as required under 35 U.S.C. § 112, first paragraph. Applicants respectfully direct the Examiner's attention to the Guidelines for the Examination of Patent Applications Under the 35 U.S.C. § 112, first paragraph "Written Description" requirement as stated in M.P.E.P. § 2163(II)(A)(2):

> Generally, there is an inverse correlation between the level of skill and knowledge in the art and the specificity of disclosure necessary to satisfy the written description requirement. **Information which is well known in the art need not be described in detail** in the specification. See, e.g., *Hybritch, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379-80, 231 USPQ 81, 90 (Fed. Cir. 1986).

Thus, the central issues are whether (1) the functionalization of nanotubes, and (2) the use of computer-aided molecular design as an aid in synthesizing/selecting molecules for a specified use were well known in the art at the time of the invention, so that there is no legal requirement for the Applicants to have described these in further detail in the Application.

As an initial matter, the Examiner attacks inventor Montgomery's credibility as being a person of skill in the art, and likens inventor Montgomery's qualifications to "putting of drywall." In support of the Examiner's assertion the Examiner states that skilled artisans in the nanotube synthesis are chemists and the Examiner appears to infer that 1996 Nobel Prize winner Richard Smalley would be an *ordinary* skilled artisan. However, contrary to the Examiner' inference, a Nobel Prize winner such as Richard Smalley would be considered an *extraordinary* skilled artisan in the field of nanotube synthesis. More importantly, the Application at hand is **not concerned with "nanotube synthesis."** In fact, as stated in the 1.132 declaration nanotube segments were commercially available at the time of the invention.

Applicants respectfully submit that one of ordinary skill in the art would indeed have been capable of ordering commercially available nantubes and applying them as taught and claimed by Applicants. Inventor Montgomery is a named inventor on several issued patents which employ carbon nanotubes in thermal interface structures, and was a Senior Thermal Architect at the time the invention was conceptualized. Accordingly, inventor Montgomery is qualified to attest to his professional opinion as to what one of ordinary skill in the art would have been capable of doing upon on review of the Application.

(1) Functionalization of nanotubes was well known in the art at the time of the invention

As a first matter, the Examiner takes issue with Exhibit B submitted on February 20, 2008 which provided a list of references demonstrating the attachment of functional groups to carbon nanotubes. The Examiner states "Note how all of the references provided describe actual chemistry ... Note also how others "took pictures" (micrographs) of their nanotubes." The Examiner asserts that the discussion of chemical reactions and micrographs proves that Applicants' disclosure

is lacking. However, this assertion misses the point of Exhibit B. The references were provided to show that functionalization of nanotubes was widely studied and **well known in the art at the time of the invention.** The micrographs referred to by the Examiner do serve to support Applicants' assertion that functionalization of nanotubes was widely studied and well known in the art at the time of the invention. Even more, the Background section of the Application discusses how the prior art utilized connector molecules to attract and bond with two open-ended nanotubes to create ropelike carbon nanotube structures. Accordingly, such well known techniques **need not be described in detail in the specification.** M.P.E.P. § 2163(II)(A)(2).

(2) The use of computer-aided molecular design as an aid in synthesizing/selecting molecules for an intended use was well known in the art at the time of the invention

As a second matter, the Examiner takes issue with the use of HyperChem as a molecular modeling tool for synthesizing/selecting a suitable "connector molecule." In particular the Examiner asks if HyperChem provides the skilled artisan with a reaction, and asks if HyperChem is based on *real* chemistry.

Applicants teach and claim in independent claims 1 and 28 a connector molecule which provides "first bonding sites capable of bonding with one end of the nanotube segments and second bonding sites capable of bonding with corresponding bonding sites of a plurality of other connector molecules, such that bonding occurs forming three-dimensional nanotube structures." It is to be appreciated that the independent claims are not limited to the detailed $C_{19}S_6H_{24}$ molecule taught by Applicants in the Application, and that such an embodiment is to regarded of illustrative rather than limiting of the "connector molecule" claimed by Applicants in the independent claims.

Exhibit A was submitted on February 20, 2008 including a list of references demonstrating that HyperChem was widely used in industry at the time of the invention as a method for modeling molecular structures and predicting structure-behavior relationships of molecules. Accordingly, inventor Montgomery attested in the 1.132 declaration that in his professional opinion that one of ordinary skill in the art at the time the invention was made, and particularly one familiar with computer-aided molecular design software such as HyperChem, upon review of the Application, would be able to synthesize the connector molecule.

The Background section of the Application further states that different connector molecules were already used for creating ropelike carbon nanotube structures. Thus, connector molecules were already used at the time of the invention for linearly connecting nanotubes. Applicants teach and claim utilizing connector molecules for three-dimensionally connecting nanotubes, and Inventor Montgomery has attested that one of ordinary skill in the art would be able to do so with the aid of computer-aided molecular design software such as HyperChem.

Therefore, in view of Applicants' disclosure and the advanced state of the art, the specific techniques for synthesizing or selecting a suitable connector molecule **need not be described in further detail in the specification**. M.P.E.P. § 2163(II)(A)(2).

For these reasons, in addition to the reasons provided in Applicants' response mailed February 10, 2008, Applicants respectfully submit that claims 1-10 and 28-31 comply with the enablement and written description requirements of 35 U.S.C. § 112, first paragraph, and request withdrawal of the rejections.

Claim Rejections - 35 U.S.C. §102

The Examiner has rejected claims 1-2, 6-10, and 28-31 under 35 U.S.C. § 102(e) as being anticipated by *Smalley et al.* (U.S. Patent No. 6,790,425). Applicants respectfully submit that the invention as claimed in claims 1-2, 6-10, and 28-31 is not anticipated by *Smalley*.

Applicants teach and claim a method for producing three-dimensional nanotube structures, where a number of nanotubes are opened to create open-ended nanotube segments, and a corresponding number of connector molecules are brought into contact with the nanotube segments. These connector molecules possess first bonding sites that bond with one end of the nanotube segments, and a second bonding site that bonds with a corresponding bonding site of a plurality of other connector molecules. That is, Applicants claim using connector molecules to bond one end of the connector molecule to one end of a nanotube segment, and using the other end of the connector molecule to bond to one end of the two or more connector molecules, where the other end of the two or more connector molecules are bonded to one end of a nanotube segment. In this way, one nanotube can be coupled to two or more other nanotubes to form a three-dimensional nanotube structure.

Applicants respectfully disagree with the rejection because *Smalley* does not disclose each and every element of the Invention as claimed in claim 1. Specifically, *Smalley* does not teach bonding one nanotube segment to two or more nanotube segments (through the use of connector molecules).

Applicants respectfully submit that the Examiner has mistakenly equated the "connector molecules" (Claim 1) in the Application with the "transitional metal catalyst atoms or particles" (*Smalley* 13, 23) disclosed in *Smalley*. In *Smalley*, the "transitional metal catalyst atoms or particles" are employed to "re-start the growth of the exposed tube ends. In this way a larger, macroscopic, ordered assembly of

SWNT is grown" (*Smalley* 13, 29-31). These "transitional metal catalyst atoms or particles" are not similar to the "connector molecules" claimed by Applicants due to the difference in function. The catalyst atoms of *Smalley* are used to re-start the growth of SWNT in a linear manner. In fact, these catalyst atoms do not actually connect nanotube segments. These catalyst atoms are used to allow the growth of SWNT when exposed to carbon feed stock at an appropriate temperature and pressure. Notwithstanding the growth process, these catalyst atoms only bond to one other nanotube segment, and do not bond to two or more nanotube segments. Because of its function, these catalyst atoms cannot be used to bond to two or more nanotube segments to form a three-dimensional nanotube structure in the manner claimed by the Application. In contrast, the "connector molecule" claimed by Applicants provides for "bonding with one end of the nanotube segments and... bonding with a corresponding bonding site of a plurality of other connector molecules" (Claim 1). These bonds give rise to the formation of the claimed three-dimensional nanotube structure.

For these reasons, Applicants respectfully submit that claim 1 is not anticipated by *Smalley* under 35 U.S.C. §102(e). Given that claims 2, and 6-10 depend directly or indirectly from claim 1, Applicants respectfully submit that claims 2, and 6-10 are likewise not anticipated by *Smalley* under 35 U.S.C. §102(e). Accordingly, Applicants respectfully request the withdrawal of the rejection of claims 1-2, and 6-10.

Claim Rejections - 35 U.S.C. §103

The Examiner has rejected claims 1-10 and 28-31 under 35 U.S.C. § 103(a) as being unpatentable over the *Johnsamuel* article. Specifically the Examiner states that the reference in combination with the Declaration teaches the existence of using a computer program to speculate upon performing chemical reactions.

Applicants agree that *Johsamuel* and the Declaration teach that molecular modeling software such as HyperChem is used as a guide for synthetic chemists. See pg. 3213, col. 2. lines 6-13 of *Johnsamuel*. However, despite the fact that molecular modeling software is used as a guide for synthetic chemists, molecular modeling software does not provide the motivation to bring a corresponding number of connector molecules into contact with a number of open-ended nanotube segments as claimed by Applicants in independent claims 1 and 28.

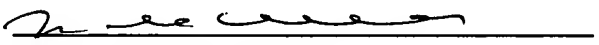
Therefore, the combination cannot render obvious Applicants' invention as claimed in claims 1-10 and 28-31, and Applicants respectfully request the withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) over the combination.

Pursuant to 37 C.F.R. § 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. §§ 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Date: June 30, 2008



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